

**Amendments to the Claims:**

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) An interpolation processing apparatus that engages in processing on image data which are provided in a colorimetric system constituted of first ~ nth ( $n \geq 2$ ) color components and include color information corresponding to a single color component provided at each pixel to determine an interpolation value equivalent to color information corresponding to the first color component for a pixel at which the first color component is missing, comprising:

an interpolation value calculation section ~~that uses~~that, by using color information at pixels located in a local area containing an interpolation target ~~pixel to undergo interpolation processing to calculate an pixel,~~ calculates the interpolation value including, at least

(1) ~~local a local average information value~~ of the first color component with regard to the interpolation target pixel and

(2) ~~local curvature information corresponding to~~values for at least two color ~~components~~components, respectively, with regard to the interpolation target pixel.

2. (Currently Amended) An interpolation processing apparatus according to claim 1, wherein:

said interpolation value calculation section calculates, as said local curvature ~~information values individually~~ corresponding to at least two color components,

(1) ~~local a local curvature information value~~ based upon a color component matching a color component at the interpolation target pixel and

(2) ~~local a local~~ curvature information value based upon a color component other than the color component at the interpolation target pixel.

3. (Currently Amended) An interpolation processing apparatus that engages in processing on image data which are provided in a colorimetric system constituted of first ~ nth ( $n \geq 2$ ) color components and include color information corresponding to a single color component provided at each pixel to determine an interpolation value equivalent to color information corresponding to the first color component for a pixel at which the first color component is missing, comprising:

an interpolation value calculation section ~~that uses~~ that, by using color information at pixels located in a local area containing an interpolation target ~~pixel to undergo interpolation processing to calculate an~~ pixel, calculates the interpolation value including, at least

(1) ~~local a local~~ average information value of the first color component with regard to the interpolation target pixel and

(2) ~~local a local~~ curvature information value based only upon a color component other than a type of a color component at the interpolation target pixel.

4. (Currently Amended) An interpolation processing apparatus that engages in processing on image data which are provided in a colorimetric system constituted of first ~ nth ( $n \geq 2$ ) color components and include color information corresponding to a single color component provided at each pixel to determine an interpolation value equivalent to color information corresponding to the first color component for a pixel at which the first color component is missing, comprising:

an interpolation value calculation section ~~that uses~~ that, by using color information at pixels located in a local area containing an interpolation target ~~pixel to undergo~~

~~interpolation processing to calculate a pixel, calculates the~~ interpolation value including, at least

- (1) ~~local a local average information value~~ of the first color component with regard to the interpolation target pixel and
- (2) ~~local a local curvature information value~~ corresponding to the first color component with respect to the interpolation target ~~pixel~~ pixel, the first color component being one of a red, green or blue value in a color space, or a chrominance value in a color space.

5. (Currently Amended) An interpolation processing apparatus according to claim 1, further comprising:

a first similarity judgment section that judges degrees of similarity to the interpolation target pixel along at least two directions in which pixels with color information corresponding to the first color component are connected with the interpolation target pixel; and

a second similarity judgment section that judges degrees of similarity to the interpolation target pixel along at least two directions other than the directions in which the degrees of similarity are judged by said first similarity judgment section, wherein:

said interpolation value calculation section selects a direction along which pixels having color information to be used to calculate said local average ~~information value~~ of the first color component are set based upon results of a judgment made by said first similarity judgment section;

(1) said interpolation value calculation section selects a direction along which pixels having color information to be used to calculate said local curvature ~~information value~~ are set based upon results of the judgment made by said first similarity judgment section if said local curvature ~~information value~~ is "~~local a local curvature information value~~ constituted

of a single color component and manifesting directionality along a direction in which degrees of similarity are judged by said first similarity judgment section"; and

(2) said interpolation value calculation section selects a direction along which pixels having color information to be used to calculate said local curvature ~~information-value~~ are set based upon results of a judgment made by said second similarity judgment section if said local curvature ~~information-value~~ is "~~local~~ a local curvature ~~information-value~~ constituted of a single color component and manifesting directionality along a direction in which degrees of similarity are judged by said second similarity judgment section."

6. (Currently Amended) An interpolation processing apparatus that engages in processing on image data which are provided in a colorimetric system constituted of first ~ nth ( $n \geq 2$ ) color components and include color information corresponding to a single color component provided at each pixel to determine an interpolation value equivalent to color information corresponding to the first color component for a pixel at which the first color component is missing, comprising:

an interpolation value calculation section that calculates an interpolation value including at least ~~two terms~~, i.e., a first term and a second term by using color information at pixels set in a local area containing an interpolation target pixel to undergo interpolation processing;

a first similarity judgement section that judges degrees of similarity to the interpolation target pixel along at least two crossing directions in which pixels having color information corresponding to the first color component are connected to the interpolation target pixel; and

a second similarity judgment section that judges degrees of similarity to the interpolation target pixel along at least two crossing directions ~~other than~~ different from the

two crossing directions in which the degrees of similarity are judged by said first similarity judgment section, wherein:

said interpolation value calculation section selects a direction along which pixels having color information to be used to calculate said first term are set based upon results of a judgment made by said first similarity judgment section and selects a direction along which pixels having color information to be used to calculate said second term are set based upon results of a judgment made by said second similarity judgment section.

7. (Currently Amended) An interpolation processing apparatus according to claim 6, wherein

said interpolation value calculation section: calculates a term containing

(a) ~~local~~ a local average information value of the first color component with regard to the interpolation target pixel and

(b) ~~local~~ a local curvature information value constituted of a single color component and manifesting directionality along a direction in which degrees of similarity are judged by said first similarity judgment section, as said first term; and

calculates a term containing ~~local~~ a local curvature information value constituted of a single color component and manifesting directionality along a direction in which degrees of similarity are judged by said second similarity judgment section, as said second term.

8. (Currently Amended) An interpolation processing apparatus according to claim 5, wherein:

when image data are provided in a colorimetric system constituted of first ~ third color components with the first color component achieving a higher spatial frequency than the second color component and the third color component, the first color component set in a checker-board pattern, the second color component and the third color component each

set in a line sequence between pixels at which color information corresponding to the first color component is present and information corresponding to the second color component present at the interpolation target pixel;

said first similarity judgment section calculates similarity degrees manifested by the interpolation target pixel along ~~two directions~~, i.e., a vertical direction and a horizontal direction, in which pixels with color information corresponding to the first color component that are closest to the interpolation target pixel are connected to the interpolation target pixel and makes a judgment with regard to degrees of similarity manifested by the interpolation target pixel along the vertical direction and the horizontal direction based upon a difference between said similarity degrees;

said second similarity judgment section calculates similarity degrees manifested by the interpolation target pixel along two diagonal directions in which pixels with color information corresponding to the third color component that are closest to the interpolation target pixel are connected to the interpolation target pixel and makes a judgment with regard to degrees of similarity manifested by the interpolation target pixel along the two diagonal directions based upon a difference between said similarity degrees; and

said interpolation value calculation section selects at least either the second color component or the first color component based upon which said "local curvature information-value constituted of a single color component and manifesting directionality along a direction in which degrees of similarity are judged by said first similarity judgment section" is provided and selects at least either the second color component or the third color component based upon which said "local curvature information-value constituted of a single color component and manifesting directionality along a direction in which degrees of similarity are judged by said second similarity judgment section" is provided.

9. (Currently Amended) An interpolation processing apparatus according to claim 8, wherein:

when said local curvature ~~information-value~~ is "~~local-a local~~ curvature ~~information-value~~ based upon a color component other than the color component at the interpolation target pixel", said interpolation value calculation section selects the first color component or the third color component to which said local curvature ~~information-value~~ is to correspond in conformance to the degrees of similarity judged by said second similarity judgment section.

10. (Currently Amended) An interpolation processing apparatus according to claim 9, wherein:

said interpolation value calculation section calculates ~~local-a local~~ curvature ~~information-value~~ based upon the first color component if said second similarity judgment section judges that roughly equal degrees of similarity manifest along the two diagonal directions and calculates ~~local-a local~~ curvature ~~information-value~~ based upon the third color component if said second similarity judgment section judges that a higher degree of similarity manifests along one of the two diagonal directions compared to the other diagonal direction.

11. (Original) An interpolation processing apparatus according to claim 8, wherein:

said first similarity judgment section judges that roughly equal degrees of similarity manifest along the vertical direction and the horizontal direction if a difference between the similarity degrees along the vertical direction and the horizontal direction is smaller than a specific threshold value; and

said second similarity judgment section judges that roughly equal degrees of similarity manifest along the two diagonal directions if a difference between the similarity degrees along the two diagonal directions is smaller than a specific threshold value.

12. (Original) An interpolation processing apparatus according to claim 8,  
wherein:

said first similarity judgment section calculates the similarity degrees along the vertical direction and the horizontal direction by using color information corresponding to a plurality of color components for a single interpolation target pixel; and

said second similarity judgment section calculates the similarity degrees along the two diagonal directions by using color information corresponding to a plurality of color components for a single interpolation target pixel.

13. (Original) An interpolation processing apparatus according to claim 12,  
wherein:

said second similarity judgment section calculates a similarity degree manifesting along each of the two diagonal directions through weighted addition of:

(1) a similarity degree component constituted of color information corresponding to the first color component alone;

(2) a similarity degree component constituted of color information corresponding to the second color component alone;

(3) a similarity degree component constituted of color information corresponding to the third color component alone; and

(4) a similarity degree component constituted of color information corresponding to the second color component and the third color component.

14. (Original) An interpolation processing apparatus according to claim 8,  
wherein:

said first similarity judgment section calculates similarity degrees along the vertical direction and the horizontal direction for each pixel and makes a judgment on similarity manifested by the interpolation target pixel along the vertical direction and the



horizontal direction based upon differences in similarity degrees manifesting at nearby pixels as well as at the interpolation target pixel; and

said second similarity judgment section calculates similarity degrees along the two diagonal directions for each pixel and makes a judgment on similarity manifested by the interpolation target pixel along the two diagonal directions based upon differences in similarity degrees manifesting at nearby pixels as well as at the interpolation target pixel.

15. (Currently Amended) An interpolation processing apparatus that engages in processing on image data which are provided in a colorimetric system constituted of first ~ nth ( $n \geq 2$ ) color components and include color information corresponding to a single color component provided at each pixel to determine an interpolation value equivalent to color information corresponding to the first color component for a pixel at which the first color component is missing, comprising:

a first term calculation section that calculates a first term representing average information of the first color component with regard to an interpolation target pixel to undergo interpolation processing by using color information corresponding to color components at pixels set in a local area containing the interpolation target pixel;

a second term calculation section that calculates a second term representing local curvature information based upon a color component matching the color component at the interpolation target pixel with regard to the interpolation target pixel by using color information corresponding to color components at pixels set in a local area containing the interpolation target pixel; and

an interpolation value calculation section that calculates an interpolation value by adding said second term multiplied by a weighting coefficient to said first term, the weighting coefficient constituted of color information corresponding to a plurality of color

components at pixels in the local area containing the interpolation target pixel ~~to said first term.~~

16. (Original) An interpolation processing apparatus according to claim 15, wherein:

said interpolation value calculation section uses color information corresponding to a plurality of color components provided at the interpolation target pixel and at a plurality of pixels set along a predetermined direction relative to the interpolation target pixel to ascertain inclinations manifesting in color information corresponding to the individual color components along the direction and calculates said weighting coefficient in conformance to a correlation manifesting among the inclinations in the color information corresponding to the individual color components.

17-22. (Canceled)

23. (Currently Amended) A recording medium having recorded therein an interpolation processing program to implement on a computer processing for determining an interpolation value equivalent to color information corresponding to a first color component missing at a pixel, on image data provided in a colorimetric system constituted of first ~ nth ( $n \geq 2$ ) color components with color information corresponding to a single color component present at each pixel, said interpolation processing program comprising:

an interpolation value calculation step in which ~~an~~ the interpolation value including, at least

(1) ~~local a local average information value~~ of the first color component with regard to an interpolation target pixel ~~to undergo interpolation processing and~~

(2) local curvature ~~information corresponding to~~ values for at least two color components, respectively, with regard to the interpolation target pixel, is calculated by

using color information provided at pixels set within a local area containing the interpolation target pixel.

24. (Currently Amended) A recording medium having recorded therein an interpolation processing program to implement on a computer processing for determining an interpolation value equivalent to color information corresponding to a first color component missing at a pixel, on image data provided in a colorimetric system constituted of first  $\sim$  nth ( $n \geq 2$ ) color components with color information corresponding to a single color component present at each pixel, said interpolation processing program comprising:

an interpolation value calculation step in which ~~an~~ the interpolation value including, at least

(1) ~~local a local average information value~~ of the first color component with regard to an interpolation target pixel ~~to undergo the interpolation processing~~; and

(2) ~~local a local curvature information value~~ based only upon a color component other than a type of a color component at the interpolation target pixel, is calculated by using color information provided at pixels set within a local area containing the interpolation target pixel.

25. (Currently Amended) A recording medium having recorded therein an interpolation processing program to implement on a computer processing for determining an interpolation value equivalent to color information corresponding to a first color component missing at a pixel, on image data provided in a colorimetric system constituted of first  $\sim$  nth ( $n \geq 2$ ) color components with color information corresponding to a single color component present at each pixel, said interpolation processing program comprising:

an interpolation value calculation step in which ~~an~~ the interpolation value including, at least

(1) ~~local~~ a local average ~~information value~~ of the first color component with regard to an interpolation target pixel ~~to undergo the interpolation processing, and~~

(2) ~~local~~ a local curvature ~~information value~~ corresponding to the first color component with respect to the interpolation target pixel, is calculated by using color information provided at pixels set within a local area containing the interpolation target pixel ~~pixel, the first color component being one of a red, green or blue value in a color space, or a chrominance value in a color space.~~

26. (Currently Amended) A recording medium having recorded therein an interpolation processing program to implement on a computer processing for determining an interpolation value equivalent to color information corresponding to a first color component missing at a pixel, on image data provided in a colorimetric system constituted of first ~ nth ( $n \geq 2$ ) color components with color information corresponding to a single color component present at each pixel, said interpolation processing program comprising:

an interpolation value calculation step in which ~~an~~ the interpolation value including at least ~~two terms, i.e.,~~ a first term and a second term is calculated by using color information at pixels set within a local area containing an interpolation target pixel to undergo interpolation processing;

a first similarity judgment step in which degrees of similarity to the interpolation target pixel are judged along at least two crossing directions in which pixels having color information corresponding to the first color component are connected with the interpolation target pixel; and

a second similarity judgment step in which degrees of similarity to the interpolation target pixel are judged along at least two crossing directions ~~other than~~ different

from the two crossing directions along which the degrees of similarity are judged in said first similarity judgment step, wherein:

in said interpolation value calculation step, a direction in which pixels having color information to be used to calculate said first term are set is selected based upon results of a judgment made in said first similarity judgment step and a direction in which pixels having color information to be used to calculate said second term are set is selected based upon results of a judgment made in said second similarity judgment step.

27. (Currently Amended) A recording medium having recorded therein an interpolation processing program to implement on a computer processing for determining an interpolation value equivalent to color information corresponding to a first color component missing at a pixel, on image data provided in a colorimetric system constituted of first ~ nth ( $n \geq 2$ ) color components with color information corresponding to a single color component present at each pixel, said interpolation processing program comprising:

a first term calculation step in which a first term representing average information of the first color component with regard to an interpolation target pixel to undergo interpolation processing is calculated by using color information corresponding to a color component at pixels set within a local area containing the interpolation target pixel;

a second term calculation step in which a second term representing local curvature information based upon a color component matching the color component at the interpolation target pixel is calculated with regard to the interpolation target pixel by using color information corresponding to a color component at pixels set within a local area containing the interpolation target pixel; and

an interpolation value calculation step in which an interpolation value is calculated by adding said second term multiplied by a weighting coefficient to the first term,

the weighting coefficient constituted of color information corresponding to a plurality of color components provided at pixels set within a local area containing the interpolation target pixel to the first term.

28-29. (Canceled)

30. (Currently Amended) An interpolation processing apparatus according to claim 2, further comprising:

a first similarity judgment section that judges degrees of similarity to the interpolation target pixel along at least two directions in which pixels with color information corresponding to the first color component are connected with the interpolation target pixel; and

a second similarity judgment section that judges degrees of similarity to the interpolation target pixel along at least two directions other than the directions in which the degrees of similarity are judged by said first similarity judgment section, wherein:

said interpolation value calculation section selects a direction along which pixels having color information to be used to calculate said local average information-value of the first color component are set based upon results of a judgment made by said first similarity judgment section;

(1) said interpolation value calculation section selects a direction along which pixels having color information to be used to calculate said local curvature information-value are set based upon results of the judgment made by said first similarity judgment section if said local curvature information-value is "local a local curvature information-value constituted of a single color component and manifesting directionality along a direction in which degrees of similarity are judged by said first similarity judgment section"; and

(2) said interpolation value calculation section selects a direction along which pixels having color information to be used to calculate said local curvature information-value

are set based upon results of a judgment made by said second similarity judgment section if said local curvature ~~information-value~~ is "~~local a local curvature information-value~~ constituted of a single color component and manifesting directionality along a direction in which degrees of similarity are judged by said second similarity judgment section."

31. (Currently Amended) An interpolation processing apparatus according to claim 30, wherein:

when image data are provided in a colorimetric system constituted of first ~ third color components with the first color component achieving a higher spatial frequency than the second color component and the third color component, the first color component set in a checker-board pattern, the second color component and the third color component each set in a line sequence between pixels at which color information corresponding to the first color component is present and information corresponding to the second color component present at the interpolation target pixel;

said first similarity judgment section calculates similarity degrees manifested by the interpolation target pixel along ~~two directions~~, i.e., a vertical direction and a horizontal direction, in which pixels with color information corresponding to the first color component that are closest to the interpolation target pixel are connected to the interpolation target pixel and makes a judgment with regard to degrees of similarity manifested by the interpolation target pixel along the vertical direction and the horizontal direction based upon a difference between said similarity degrees;

said second similarity judgment section calculates similarity degrees manifested by the interpolation target pixel along two diagonal directions in which pixels with color information corresponding to the third color component that are closest to the interpolation target pixel are connected to the interpolation target pixel and makes a judgment

with regard to degrees of similarity manifested by the interpolation target pixel along the two diagonal directions based upon a difference between said similarity degrees; and

said interpolation value calculation section selects at least either the second color component or the first color component based upon which said "local curvature ~~information-value~~ constituted of a single color component and manifesting directionality along a direction in which degrees of similarity are judged by said first similarity judgment section" is provided and selects at least either the second color component or the third color component based upon which said "local curvature ~~information-value~~ constituted of a single color component and manifesting directionality along a direction in which degrees of similarity are judged by said second similarity judgment section" is provided.

32. (Currently Amended) An interpolation processing apparatus according to claim 31, wherein:

when said local curvature ~~information-value~~ is "~~local-a~~ local curvature ~~information-value~~ based upon a color component other than the color component at the interpolation target pixel", said interpolation value calculation section selects the first color component or the third color component to which said local curvature ~~information-value~~ is to correspond in conformance to the degrees of similarity judged by said second similarity judgment section.

33. (Currently Amended) An interpolation processing apparatus according to claim 32, wherein:

said interpolation value calculation section calculates ~~local-a~~ local curvature ~~information-value~~ based upon the first color component if said second similarity judgment section judges that roughly equal degrees of similarity manifest along the two diagonal directions and calculates ~~local-a~~ local curvature ~~information-value~~ based upon the third color



component if said second similarity judgment section judges that a higher degree of similarity manifests along one of the two diagonal directions compared to the other diagonal direction.

34. (Original) An interpolation processing apparatus according to claim 31, wherein:

said first similarity judgment section judges that roughly equal degrees of similarity manifest along the vertical direction and the horizontal direction if a difference between the similarity degrees along the vertical direction and the horizontal direction is smaller than a specific threshold value; and

said second similarity judgment section judges that roughly equal degrees of similarity manifest along the two diagonal directions if a difference between the similarity degrees along the two diagonal directions is smaller than a specific threshold value.

35. (Original) An interpolation processing apparatus according to claim 31, wherein:

said first similarity judgment section calculates the similarity degrees along the vertical direction and the horizontal direction by using color information corresponding to a plurality of color components for a single interpolation target pixel; and

said second similarity judgment section calculates the similarity degrees along the two diagonal directions by using color information corresponding to a plurality of color components for a single interpolation target pixel.

36. (Original) An interpolation processing apparatus according to claim 35, wherein:

said second similarity judgment section calculates a similarity degree manifesting along each of the two diagonal directions through weighted addition of:

(1) a similarity degree component constituted of color information corresponding to the first color component alone;

(2) a similarity degree component constituted of color information corresponding to the second color component alone;

(3) a similarity degree component constituted of color information corresponding to the third color component alone; and

(4) a similarity degree component constituted of color information corresponding to the second color component and the third color component.

37. (Original) An interpolation processing apparatus according to claim 31, wherein:

said first similarity judgment section calculates similarity degrees along the vertical direction and the horizontal direction for each pixel and makes a judgment on similarity manifested by the interpolation target pixel along the vertical direction and the horizontal direction based upon differences in similarity degrees manifesting at nearby pixels as well as at the interpolation target pixel; and

said second similarity judgment section calculates similarity degrees along the two diagonal directions for each pixel and makes a judgment on similarity manifested by the interpolation target pixel along the two diagonal directions based upon differences in similarity degrees manifesting at nearby pixels as well as at the interpolation target pixel.

38. (Currently Amended) An interpolation processing apparatus according to ~~any one of~~ claim 3, further comprising:

a first similarity judgment section that judges degrees of similarity to the interpolation target pixel along at least two directions in which pixels with color information corresponding to the first color component are connected with the interpolation target pixel; and

a second similarity judgment section that judges degrees of similarity to the interpolation target pixel along at least two directions other than the directions in which the degrees of similarity are judged by said first similarity judgment section, wherein:

said interpolation value calculation section selects a direction along which pixels having color information to be used to calculate said local average ~~information-value~~ of the first color component are set based upon results of a judgment made by said first similarity judgment section;

(1) said interpolation value calculation section selects a direction along which pixels having color information to be used to calculate said local curvature ~~information-value~~ are set based upon results of the judgment made by said first similarity judgment section if said local curvature ~~information-value~~ is "~~local-a local~~ curvature ~~information-value~~ constituted of a single color component and manifesting directionality along a direction in which degrees of similarity are judged by said first similarity judgment section"; and

(2) said interpolation value calculation section selects a direction along which pixels having color information to be used to calculate said local curvature ~~information-value~~ are set based upon results of a judgment made by said second similarity judgment section if said local curvature ~~information-value~~ is "~~local-a local~~ curvature ~~information-value~~ constituted of a single color component and manifesting directionality along a direction in which degrees of similarity are judged by said second similarity judgment section."

39-42. (Canceled)

43. (New) An interpolation processing apparatus according to claim 1, wherein:

the local average value and the local curvature values are calculated in accordance with directionality of similarity with regard to the interpolation target pixel.